

December 8th, 1863.

E. W. H. Holdsworth, Esq., in the Chair.

Mr. A. E. Knox made some remarks on the supposed date of extinction of the Mole (*Talpa vulgaris*) and the Weasel (*Mustela vulgaris*) in Ireland.

Mr. Fraser exhibited the skin of a Leopard from Japan, which he identified as being the *Felis (Leopardus) japonensis* of Dr. Gray, described and figured in the Society's Proceedings for 1862, p. 262, pl. 33. This, being the second specimen only which had come under the notice of the scientific world, tended to confirm the views of Dr. Gray as to the distinctness of the species.

The following letter, addressed to the Secretary by Mr. W. H. Pease, Corr. Member, and dated Honolulu, Sandwich Islands, Oct. 1, 1863, was read to the Meeting:—

“SIR,—I have received lately the ‘Proceedings of the Zoological Society’ issued during the past three years. On looking over them, I discover a few errors and omissions in the papers contributed by me, which are of sufficient importance to be corrected, viz. :—

“P. Z. S. 1860, p. 32.—The genus ‘*Doriprismatica*’ is so divided in printing, that the species described would appear to belong to the genus *Doris*. They should stand as ‘*Doriprismatica imperialis*’ and ‘*Doriprismatica lineata*.’

“P. Z. S. 1861, p. 245.—It appears that I omitted the specific name of the *Pleurobranchus* here described. It should read ‘*P. tessellatus*’; and on the following page (246), the *Lobiger* there described is *L. viridis*.

“P. Z. S. 1860.—In the Table of Contents I am credited as being the author of a new genus of *Planariidæ*, bearing my own name!—‘*Peasia*,’ and several species. The mistake will be explained by referring to the footnote, page 37. I should not consider this of sufficient importance to notice, had not one of the editors of the ‘American Journal of Science and Arts’ fallen into the same error, and taken occasion to publish a very harsh and severe criticism on that paper.

“Yours &c.,  
“W. H. PEASE.”

“I also notice that several of the names of the species described in my papers in 1860, have been preoccupied by Dr. Kelaart. I therefore propose to change them as follows:—

“*Doris excavata*, Pease, into *D. oreosoma*.

“*Doris papillosa*, Pease, into *D. tincta*.

“*Pleurobranchus reticulatus*, Pease, into *P. violaceus*.”

The Secretary read the following note on the breeding of an exotic Tortoise at Tregulow, in Cornwall, the seat of Mr. William Williams, F.Z.S., in continuation of a former communication on the same subject\* :—

“The head gardener found a single egg this year, on the 7th July, and immediately removed it to a pine-pit, the temperature of which has been about 70° at night and from 85° to 90° by day. On the 28th of September a fine male specimen was hatched, stronger than those produced last year. After the egg had been deposited in a hole similar to that mentioned in a former account, the Tortoise proceeded to make it stand upright; having accomplished this, she at once covered it with earth.

“The young one burst the shell on the side, and walked away, leaving the other half entire.

“Tregulow, 30th September, 1863.”

The following papers were read :—

1. ON THE SYSTEMATIC POSITION OF THE CRESTED SCREAMER  
(PALAMEDEA CHAVARIA). BY W. K. PARKER.

Many years ago, at a time when the only collection of foreign living creatures seen by me was contained in Wombwell's travelling menagerie, my observations on the structure of birds were necessarily confined, for the most part, to our native species. I am glad of this now, as they are nearly all of *pure* types; and from childhood their life and conversation yielded me a pleasure nearly equal to that derived from communion with bipeds of the plumeless kind.

If the structure of the pure or unmixed types had not been studied by me first in such a way as to make the most definite mind-images, there would have been for me no good firm ground to stand upon whilst contemplating the structure and relationships of such birds as the Trumpeter (*Psophia*), the Cariama (*Dicholophus*), and the *Palamedea*. Any study, however, of the Birdclass which should go no further than its own border-line would be fruitful in bringing to light difficulties and even paradoxes: a physiologist might as well study the functions of one class of organs to the total neglect of the rest of the body, the beautiful *whole*. I have for some time past held to the belief that the birds should not be termed a class, as though they formed a group *equal* to that of the Mammalia; I find that Professor Huxley holds the same views.

If that is the case, we have some explanation of the great uniformity of the feathered tribes; for it is a fact that the remotest forms in the group are really not far apart in nature, and the smaller groups are closely intertwined one amongst another.

There are two principal conditions of nearness to the Reptilia in the great Birdgroup: first the combination of mammalian and of reptilian characters with what is truly ornithic, as in the Ostriches;

\* See P. Z. S. 1862, p. 266.

and the second is when the aberrant characters are only reptilian, and for the most part *lacertian*\*.

Now it is with *lacertian* characters, rather than with what we find in the Crocodile and the Chelonian, that we have to deal in such birds as the *Palamedea* and other mixed forms which are not far from it in actual nature, but are striving, as it were, to attain to the full typicalness of other groups than that to which the *Palamedea* really belongs.

The discovery of such a marvellous creature as Von Meyer's *Archæopteryx* must of necessity give the scientific mind a thirsty longing to know more of the relations, and of the true causes of the relations, of these mid vertebrates, the reptiles and birds,—cold-blooded, scaly, slow, and often loathsome on one hand; on the other warm, intensely active, and endowed with the highest locomotive powers, and beautiful beyond the power of words to express.

There are two very beautiful groups of birds, rich in species, with very clearly defined characters, both standing at about the same "ornithic" height above the Ostriches, and in a very similar contiguity to the Lizards: these are the true "Gallinæ" and the true "Anatinæ." In the latter family we have all the birds from the Spur-winged Goose (*Plectropterus*) to the Goosander, inclusive; in the former, the "Phasianinæ" and the "Tetraoninæ"—the typical and subtypical Fowls. The Flamingo is truly *lamellirostral*; but its anatine characters are confused and mixed up with those that are derived from the Ibis and the Crane. Again, in the Fowls, we have carefully to keep the "Cracinae," the "Hemipodiinæ," the "Megapodiinæ," and the "Pteroclinæ" in separate circles, because the *woof* of their nature is one thing, and the *warp* another; they are not zoologically *pure*, not *wholly* Gallinaceous. The parts first formed in the embryonic skull—those which are most central, and least and most slowly affected by the causes that fit each creature for its place and work in nature—these are strangely alike in both the "Sifters" and the "Scrapers"; and for a long while this fact has been a mystery and almost a paradox to me. I care very little for the webs between the toes; their absence or presence may suffice to separate between *genus* and *genus*, but not between *family* and *family*, still less between *order* and *order*.

The water-birds may, however, be divided very easily into two groups by the presence or absence of two very curious membranous spaces appearing in the occipital plane. These *fontanelles* separate the auditory from the superoccipital cartilage,—and are scarcely open at all in the true "Ardeinæ," the "Rallinæ," the "Podicipinæ," and the "Pelecaninæ"; nor do they appear in the Land and Tree groups of birds.

In the "Ibidinæ," the "Lamellirostres," the Gruine, Pluvialine, and Tringine groups, they are large and persistent; in the "Larinæ" they soon fill up with bone, and so they do in *Ædicnemus*, and apparently in the Bustards. Now the great embryological distinctions

\* The skull of every bird known conforms, on the whole, not so much to the *crocodilian* as to the *lacertian* type; their horny jaw-sheaths, large symmetrical sternum, and almost fixed ribs are *chelonian* in their nature.

between the skull and face of the Geese and Fowls are, first, that in the latter the space between the periotic mass and the superoccipital cartilage is a mere chink, in the latter a persistent oval space; and secondly that the anterior parts of the face, viz. the premaxillæ, prevomers, and dentaries are small and compressed in the Fowls, large and outspread in the sifting birds. The body of the tongue partakes of the general expansion of the face in the Geese; the descending part of the lachrymal suffers from the general contraction of the parts in the face of the Fowl. Moreover the true Fowls ("Phasianinæ" and "Tetraoninæ") have the head of the os quadratum less bifid at its joint with the skull, and therefore nearer the Ostriches and reptiles in its structure than the same bone in the Goose-tribe. It is highly worthy of remark, however, that the Sand-Grouse, *Hemipodii*, Megapodes, and Curassows all agree with the Geese and their allies in having a subornithic condition of this famous bone; and its upper articular crura begin to be quite distinct representatives of the legs of the mammalian "incus." This, be it noticed, makes the four groups of mixed "Gallinæ" correspond, not only with the Lamellirostres, but also with all those puzzling border-birds which must be studied in connexion; such as *Psophia*, *Parra*, *Cariama*, and *Palamedea*.

Now the Rail-tribe, to which *Palamedea* has been supposed to belong, has been for a long time burdened (on paper) with a very false army-list. Everything alive that has had the misfortune to be possessed of large unwieldy feet has been added to this feeble-minded, cowardly group, until it has become a mixed multitude, with discordant voices, and with manners and customs having no consonance or relation. In a former paper I had the assurance to disband the Cassowaries and Megapodes; in the present I shall permit all birds having much of the nature of the Plover (such as *Parra*), and all those which have in them the nature of a Goose, to depart from the Rail-tribe: I shall retain the *Psophia* as an outpost, notwithstanding that it is more than half a Crane.

A very large number of the genera of birds partake of a structure and nature which may very appropriately be called Passerine; and another very large group, both of genera and families, may also be called Pluvialine,—the common Golden, Grey, and Dotterel Plovers being typical of these groups, which run up through the Sandpipers and Curlews to the Ibises in one direction, through the Lapwing and Stone-Plover to the Bustards and Cranes in another, and through *Chionis* and the Pratincole to the Petrels and Gulls. Still this does not exhaust the pluvialine birds; for the Geese and their allies are related on one hand to the Ibises through the Flamingo, and on the other to the Cranes, although the proper connecting link in this case is doubtful, *Palamedea* lying obliquely, not directly, between them. The Megapodes, Hemipodes, Sand-Grouse, and Tinamous also have no little proportion of the Plover in their nature. The Jacanas (*Parra*) are essentially Plovers, although they have something of the Rail in them, especially in their skull; and they are united to the typi-



cal forms by other Spur-winged Plovers (*Pluvianus spinosus*, Gould). Now, looking at the anatine birds as a great division of specialized forms parallel with, and intimately related to, the pluvialine birds, we begin to see how they can be related to the mixed "Gallinaceæ," which have so much of the Plover in their essence. But we had much, at starting, in common between the typical and pure Fowls and the Duck and Goose tribe; add to this the fact that the Mound-makers and Curassows come much nearer to the "Anatinæ," and then suppose an anatine bird in which the horny denticles are feeble, but abundant, and the jaws compressed, stout, and trenchant, the same bird having the occipital region in harmony, not with the Geese, but with the Fowls,—put all these things together, and we shall be supposing what really exists in the *Palamedea*. Then we can calmly look at the fact that those Geese which have spurs in their wings, like those of the *Palamedea* (viz. *Chenalopex* and *Plectropterus*), have their legs longer, more grallatorial, and better under them than the typical forms, and that the Spur-winged Goose (*Plectropterus*) has a pelvis exactly intermediate between that of a typical Goose and that of a *Palamedea*. It is worth while to notice the thick down that covers the *Palamedea*, the height of the bare tract on the tibia, and the reticulated tarsi, like those of the Goose, and not like those of the Cranes and Rails, which have them scutellate in front. Whilst removing the viscera, I saw that the trachea and inferior larynx were truly anserine; for there are no inferior laryngeal muscles, the contractors of the trachea ending one-third of an inch above the bifurcation, and only a delicate fan-shaped fascia going to the half-rings. Moreover the trachea itself, from being flat and cartilaginous, becomes round and then compressed and osseous an inch above the bronchi, so that it cannot be mistaken for the trachea of any other than an anatine bird. There is nothing whatever in the digestive organs, which are extremely voluminous, to separate the bird from the Geese; yet the gizzard is not so strong as in the types, and the cæca coli are shorter and wider. I have at present only hinted at the osteology of the *Palamedea*. It diverges from the Goose in all this part of its composition, just as much as it converges towards the Curassow and the *Talegalla*; but it is not only more galline than the true Geese (we have seen that both Geese and Fowls have much in common), it is also plainly more *lacertine*. It will require a goodly memoir to do it justice; but in this short notice I must mention one or two things. Its *large soft* tongue, which has not the papillæ horny, has in it the cerato-hyals, ossified from separate points as in the Goose and Hen, much nearer the former than the latter; but the free thyro-hyals are flattened from above downwards, and cannot be mistaken for those of any other but an anserine or anatine bird. All the skull and face, except at its two ends, conforms to the lamellirostral type. Point by point, process by process, lamina for lamina, all else is truly and distinctly that which belongs to the Sifter, and to no other bird. It may be said indeed that this bird is not a Sifter; it is, however, a browser and a grazer; and being of Lincolnshire descent, and

familiar with the fens, I am well acquainted with the grazing habits of the typical Goose\*. There is a little of the Crane in the sternum; but, on the whole, the skeleton may be said to belong to a very *lacertian* Goose. This is cautiously said; for have we not four fore claws in the wing, extremely long sprawling toes, and the ribs perfectly destitute of the nearly universal tie-bones or appendages? This deficiency is unique amongst birds; and the Crocodiles possess these appendages: I consider this a *lacertian* character, as their occasional presence in Lizards is as exceptional as their absence in birds. Now amongst the rib-like bones in the fossil skeleton of the *Archeopteryx* I see nothing like an appendage starting from any one of them; nor has Professor Owen figured anything of the kind in his beautiful memoir in the 'Philosophical Transactions.' Let it be added that, although several genera of birds have spurs to their wings, these birds all lie nearly on the *same ornithic plane* as the *Palamedea*, —the Syrian Blackbird (*Merula dactyloptera*) (see Professor Owen on *Archeopteryx*, p. 39) being the only exception. The Megapode is also mentioned by Professor Owen (*ibid.*); but that is a great help to me, and comes in well.

So we see that the birds with nails in their wings are (with one or two exceptions) all aquatic types, the more unspecialized forms of which are for the most part possessed of dorsal vertebræ conjoined by a cup-and-ball (opisthocælian) articulation, and are very far below the typical tree-birds in their structure and in their habits.

But the digit-claws appear in other birds which have not outstanding spurs. Professor Owen (*ibid.* p. 39) mentions the *Apteryx* has having the mid digit terminating in a joint, which supports a curved claw; the Emeu and the Cassowary have the same structure; and the *Rhea* has an unguis phalanx covered with a claw added to the index-finger, which is generally composed of one joint in birds. The Swan, as well as the Chaja (*Palamedea*), have the same, and they both have the mid-finger series complete, the last joint being most perfect in the Swan (*Cygnus olor*). The furculum of the *Palamedea* is more like that of that great pluvialine the Bustard (*Otis tarda*) than that of a Goose; but it is very much more solid: its only counterpart for relative size is that of the *Archeopteryx*. The coracoids are strong bony tubes, open below by a large scooped hollow. The sternum of this bird differs from that of the Goose or Swan by just so much as the sternum of the Short-winged Rails, especially *Brachypteryx*, differs from that of the ordinary types. It is narrower behind, and the episternum is gone from the front: yet it is thoroughly anserine in character, for the keel does not reach the end; and, indeed, it is in this respect intermediate between what we see in the Geese and what occurs in the "Totipalmatæ." Eight ribs reach the sternum by hæmapophyses, as in the Swan; there are seven in the Goose, *Psophia*, and Serass Crane. On the right side there are

\* "—— the cackling goose,  
Close-grazer ———."

*Philips's Cyder.*

a pair of floating hæmapophyses (reptilian), and these answer to the fourth and fifth so-called sacral vertebræ. In the Swan these hæmapophyses are better developed, and the penultimate has a long rib reaching it from the sacrum on both sides. And this brings me to say that the sacrum in birds, although actually of great length, has superadded to it a number of dorso-lumbar vertebræ in front, and often several true caudals behind.

Professor Owen (*ibid.* pl. 3. fig. 5) makes the first postfemoral joint in the young Ostrich to be the first true caudal. I cannot agree with him here; for I think that the sacrum in birds is long as a *prolepsis* of that of the mammal, but that it is an exaggeration of the mammalian sacrum. In the *Archeopteryx* there are four vertebræ behind the acetabula before we come to those marked caudal by Professor Owen (*ibid.* pl. 4. fig. 1 *c, d*). This has led me to run over the birds' pelvis in my own collection and drawings; and the following table, which gives the number of vertebræ, closely embraced and tied together by the extension backwards of the iliac bones behind the acetabula, in different birds, is the result of my observations. I shall remark upon the bearings of these facts afterwards.

TABLE.

Birds built on the Passerine type.	Corvus frugilegus.....	4	Accipitres diurnæ.	Falco peregrinus .....	4		
	Gymnorhina tibicen.....	4		— asalon .....	4		
	Turdus merula .....	4		— tinnunculus .....	4		
	Estrela phaëton .....	3		Accipiter nisus .....	4		
	Pyrrhula vulgaris.....	4		Buteo vulgaris .....	4		
	Emberiza citrinella .....	4		Milvus regalis .....	4		
	Linaria chloris .....	4		Circus cyaneus .....	4		
	Pyranga rubra .....	4		— cineraceus .....	4		
	Loxia cardinalis .....	4		Elanus melanopterus .....	4		
	Muscicapa grisola .....	3		Aquila chrysaëtos .....	4		
	Budytes rai .....	4		Haliaëtus albicilla .....	4		
	Pratincola rubetra .....	4		Dicholophus cristatus .....	4		
	Motacilla yarrellii .....	4		Vulturinæ.	Neophron percnopterus ..	4	
	Sylvia cinerea .....	4		Accipitres	Ulula aluco .....	4	
	Phyllopnæuste trochilus ..	4		nocturnæ.	Strix flammea .....	4	
	Parus ater .....	4			Asio otus .....	4	
	Hirundo urbica .....	4			Athene noctua .....	4	
	— rustica .....	4			Pigeons.	Columba livia .....	4
	Sitta europæa .....	4			— palumbus .....	4	
	Lanius collurio.....	4			Cracinae.	Oreophasis derbyanus .....	4
Cypselus apus .....	4			Crax globicera .....	4		
Caprimulginae.	Podargus humeralis.....	4	Phasianinae.	Dendrotyx .....	4		
	Caprimulgus europæus ..	3		Gallus domesticus .....	4		
Alcedinidæ.	Alcedo ispida .....	5	Tetraoninae.	Lagopus scoticus .....	4		
	Upupa epops .....	4	Hemipodiinæ.	Hemipodius varius .....	4		
	Dacelo giganteus .....	4	Pteroclinæ.	Syrnhaptes paradoxus .....	4		
Trochilidæ.	Trochilus colibris.....	3	Megapods.	Talegalla lathamii .....	4		
Bucerinæ.	Buceros ruficollis.....	6		Crex pratensis .....	4		
	Cuculus canorus .....	3	Rallinæ.	Ocydromus australis .....	4		
	Picus viridis .....	4		Gallinula chloropus.....	4		
	Corythaix buffoni.....	4		Fulica atra .....	4		
Zygodactyles.	Ramphastos toco .....	6	Ardeinæ.	Botaurus minutus .....	4		
	Agapornis pullaria .....	4		Ardea cinerea .....	4		
	Psephotis multicolor .....	4		— purpurea .....	4		
	Psittacus erythacus .....	4		Herodias garzetta .....	4		

Ardeinæ.	{	Nycticorax ardeola . . . . .	4	Long-billed Plovers.	{	Hæmatopus ostralegus . . . . .	4
		Tigrisoma leucolophum . . . . .	4			Himantopus melanopterus . . . . .	4
		Eurypyga helias . . . . .	3			Numenius arquata . . . . .	5
		Cancroma cochlearia . . . . .	5			Totanus fuscus . . . . .	4
		Balæniceps rex . . . . .	5			Scolopax gallinago . . . . .	4
Ibidinæ.	{	Leptoptilus argala . . . . .	4	Snipes.	{	— gallinula . . . . .	3
		Scopus umbretta . . . . .	4			Jacanas.	Parra jacana . . . . .
		Threskiornis æthiopicus . . . . .	5	Ostriches.	{	Dromaius ater . . . . .	11
		Platalea leucorodia . . . . .	6			Struthio camelus . . . . .	9
Phœnicopterus antiquorum . . . . .	5	Apteryx australis . . . . .	4				
Anatinæ.	{	Palamedea chavaria . . . . .	4	Gulls.	{	Tinamus robustus . . . . .	8
		Plectropterus gambensis* . . . . .	7			Glareola torquata . . . . .	4
		Anser palustris . . . . .	9			Gavia ridibunda . . . . .	4
		Cygnus olor . . . . .	11			Larus canus . . . . .	4
		Dafila caudacuta . . . . .	7			Petrels.	Puffinus brevicauda . . . . .
Gruinæ.	{	Anas boschas . . . . .	8	Grebes.	{	Diomedea exulans . . . . .	5
		Mergus albellus . . . . .	8			Podiceps rubricollis . . . . .	9
Otinæ.	{	Psophia crepitans . . . . .	4	Totipalmatæ.	{	Phalacrocorax carbo . . . . .	9
		Otis tarda . . . . .	5			Divers.	{
Plovers.	{	Ædicnemus crepitans . . . . .	5	Uria troile . . . . .	5		
		Vanellus cristatus . . . . .	4	Alca torda . . . . .	4		
		Charadrius hiaticula . . . . .	3	Penguins.	Spheniscus demersus . . . . .	4	

This table is large enough for all reasonable purposes; and its results are very striking, and cannot have had their extreme uniformity caused by chance. If we leave out all those birds which, for swimming and especially diving purposes, have the sacrum extremely long and much ankylosed, such as the Sifters, Grebes, Loons, Cormorants, and also the Ostriches (excluding the *Apteryx*), we shall have four post-acetabular joints as the medium number. A large proportion of all birds have exactly four vertebræ in rear of the thigh-bones; many have only three, and about as many more have five. As a rule, the small birds of a group have the tendency to drop a joint occasionally; thus the little *Estrelida* has one less than the other Finches, the Dotterel one less than the other Plovers, and the Crake one less than the other Rails. The medium-sized rapacious birds, both nocturnal and diurnal, have only three. Now, if we consider that all the vertebræ above four in the posterior part of the Duck's pelvis really belong to the tail, then, as I long ago found, the ploughshare-bone is composed of ten segments, as four of the apparently sacral bones are really caudal; and as there are eight intermediate vertebræ, the large number of twenty-two is obtained—one more than the *Archeopteryx* possesses according to Professor Owen's method of enumeration.

Also in the *Palamedea* two of the ankylosed bones belong to the tail; there are six free bones, the last having had a rather late addition in the penultimate joint, so that it may be considered as eleven: this gives us nineteen caudal vertebræ for the subject of this paper—only two less than in the *Archeopteryx*. The same method gives us twenty-four for the Swan, sixteen for the Emeu, and twenty-two for the Cormorant.

That five of the so-called sacral vertebræ of the *Palamedea* belong to the dorso-lumbar region is evident, because the first three have hæmapophyses reaching the sternum, and on the right side there

\* *Anseranas melanopterus*, a very *Gruine* Goose, has only 6.



are two more sternal ribs in a rudimentary condition. There are seventeen vertebræ fused together, five of which must be supposed removed from the front part and two from behind, thus leaving ten proper sacral vertebræ.

In small birds and in birds of the higher types with short pelves, the number of true sacral vertebræ will be only about seven on an average—a common number amongst the large herbivorous Mammalia.

As I have only touched upon the points of interest in this skeleton, when I have acquired a fuller knowledge of it and of its congeners, and of the bearings and relations of the feathered tribes generally, I hope to take it up again. Certainly amongst living birds there is not one possessing characters of higher interest; none that I am acquainted with come nearer, in certain important points, to the Lizard; and there are parts of its organization which make it very probable that it is one of the nearest living relatives of the marvelous *Archeopteryx*\*.

## 2. NOTE ON THE BREEDING OF BENNETT'S CASSOWARY IN THE SOCIETY'S GARDENS. BY P. L. SCLATER, M.A., PH.D., F.R.S., SECRETARY TO THE SOCIETY.

(Plate XLII.)

In some notes on the method of incubation of the Struthious birds read before the Society in June last †, I mentioned the fact of our pair of the Mooruk or Bennett's Cassowary (*Casuarus bennettii*), received from Dr. Bennett in 1858, having again commenced breeding in the previous month. The female began to lay in the middle of the month of March, and deposited eggs at intervals of about eight days. The male bird commenced the duty of incubation on the 25th of the month, at which time five eggs had been deposited. One other egg was subsequently laid by the female. On the 17th of June, after an incubation of fifty-two days, a single young bird was produced, which, however, was in a very weak state, and only lived about twelve hours.

The accompanying drawing by Mr. Wolf will serve to record the external appearance of this interesting chick, which is, I believe, the only existing example of a young bird of any species of Cassowary bred in Europe.

I may remark that this is the fourth year in which our female Mooruk has attempted to breed. In April 1860 three eggs were laid without intercourse with the male bird, and of course unfruitful. In 1861 four unproductive eggs were likewise deposited, although frequent copulation had taken place between her and a male Common

\* The cup-and-ball joints in the dorsal region of many water-birds and of the Parrots must be looked upon as a general reptilian character; so also the single head of the "os quadratum" in the Ostriches. The very simple palatines of the latter birds and of the *Palamedea*, the very long free toes and the simple ribs of the Screamer, and of these are more properly *lacertian*.

† See *antea*, p. 233 *et seq.*



2.

W. G. S. 1863

M & N. Hanhart. Imp

CASUARIUS BENNETTII, (Jur.)



Cassowary. In 1862, out of six eggs deposited, which we had every reason to believe were duly impregnated, frequent copulation having taken place with the male Mooruk, a single young one, apparently a fine and healthy bird, was hatched on September 4th, after seven weeks' incubation by the male bird. Unfortunately, however, the young bird was destroyed by rats the night after its birth.

### 3. ON THE LAND-SHELLS OF SOUTH AUSTRALIA. BY GEORGE FRENCH ANGAS, CORR. MEM.

Until very recently the terrestrial Molluscan fauna of the province of South Australia was almost unknown to science, two species of *Helix*, a *Succinea*, and a *Blanfordia* constituting all the described species; and of these, both the *Helices* occur also in other parts of Australia, and the *Blanfordia* in Tasmania. The absence from the colony of collectors or persons interested in natural history, and the rarity and local distribution of the species, may account for our hitherto limited acquaintance with the subject.

The dryness of the climate during a greater portion of the year, together with the absence of underwood or luxuriant vegetation, are inimical to the development of the Pulmonifera in South Australia; whilst the rich belts of tropical forest called "brushes," that extend along the east coast of Australia between the Cordillera and the Pacific Ocean, are the abode of numerous fine species, including those large *Helices* *H. falconeri* and *H. macconnelli*, and that peculiar flattened group of which *H. cunninghami* may be regarded as the type. As these primeval belts of forest fall before the axe of the settler the larger species will probably disappear at no very distant period, or be found only in a semifossil state, like the *Pachyotis* of St. Helena. With the exception of a small *Succinea* (*S. arborea*, Ad. & Ang.), none of the South Australian Pulmonifera appear to be arboreal in their habits. The vast tracts of fertile park-like country, studded with gigantic *Eucalypti*, are as destitute of Snails as are the arid sandy regions of the Mallee scrub. The few localities throughout the colony favourable to molluscan existence are those where patches of small bushes occur amongst rocks and in deep glens and ravines of hills, which afford shelter from the sun and the hot northerly winds. Several species are also met with beneath the tufts of "salt-bush" that are scattered over the vast plains of the interior towards Lake Torrens, and in the crevices of sandstone rocks, and under stones and decayed logs.

During a residence of three years in South Australia my researches were rewarded by the discovery of twelve new species of *Helix*, two of *Bulimus*, a *Succinea*, and a *Vertigo*, many of which have been lately described by Dr. Pfeiffer, &c., either in these 'Proceedings' or in the French 'Journal de Conchyliologie.'

Subjoined is a list of all the species of South Australian Pulmonifera that have been described, to which are added descriptions of several other species by Arthur Adams and myself.



1. *HELIX* (*XANTHOMELAN*) *PERINFLATA*, Pfr.

An interesting species belonging to a North Australian group, of which *H. pachystyla* is the type. The single specimen in my collection was obtained at the McDonnell Ranges, in the far north of the colony, by my friend Mr. Waterhouse, who accompanied Stuart's expedition.

2. *HELIX* (*HADRA*) *LORIOLIANA*, Crosse.

This is the largest South Australian species yet discovered. It is an elegant shell, with a somewhat effuse aperture, of a yellowish horn-colour, banded with orange-brown.

From the ravines of the western slopes of Flinders Range, near the head of Spencer's Gulf.

3. *HELIX* (*HADRA*) *ANGASIANA*, Pfr.

In form more globular than *H. lorioliana*, deeply umbilicated, and with the aperture smaller, and the outer lip thickened and reflexed. The style of colouring is very similar to the preceding.

Found under "salt-bushes" on the plains at Arrowie, near Lake Torrens.

4. *HELIX* (*HADRA*) *CASSANDRA*, Pfr.

A delicate pale-brown and whitish-banded species, somewhat depressed in form, with the outer lip but slightly reflexed.

From bushy patches amongst the sandstone-cliffs on the banks of the Lower Murray River.

5. *HELIX* (*HADRA*) *LINCOLNIENSIS*, Pfr.

A rich-purplish, vinous-brown, somewhat depressed species, with the outer lip rather thin.

From under logs and bushes at Port Lincoln.

6. *HELIX* (*HADRA*) *EVANDALEANA*, Pfr.

An interesting species, with the whorls keeled at the periphery, of a rugose character, with a large umbilicus, and of a peculiar snuff-brown colour.

Found under dead logs at Evandale.

7. *HELIX* (*HADRA*) *STUTCHBURYI*, Pfr.

A somewhat thin, pale straw-coloured shell with a faint band; intermediate between *H. cassandra* and *H. gilberti* of New South Wales.

From the scrubs near Port Elliott.

8. *HELIX* (*HADRA*) *PATRUELIS*, Ad. & Ang., n. s.

*H. testa depresso-conoidali, late et profunde umbilicata, rufa, fascia pallida transversa prope suturas ornata; spira valde depressa; anfractibus 5, convexiusculis, rugoso-granulosis, ad suturas corrugatis, anfractu ultimo ad peripheriam subangu-*

*lato; apertura lunato-ovata, margine columellari subreflexo umbilicum partim tegente.*

Long.  $5\frac{1}{2}$  lin., lat. 10 lin.

*Hab.* Port Lincoln, under dead logs (*Coll. Angas.*).

This handsome species is of a rich rufous brown, adorned with a pale band near the sutures. It seems to combine the characters of *H. lincolnensis* and *H. cassandra*.

9. HELIX (HADRA) FLINDERSI, Ad. & Ang., n. s.

*H. testa globoso-conoidali, tenuicula, mediocriter umbilicata, fusco-albida; anfractibus  $4\frac{1}{2}$ , convexiusculis, rugoso-strigillatis, ultimo magno inflato; apertura lunato-ovata, labio callo umbilicum partim tegente.*

Long. 7 lin., lat. 7 lin.

*Hab.* Tillowie, near western slopes of Flinders Range (*Coll. Angas.*).

This remarkably compact and globose species, of which only two specimens have hitherto been found, is characterized by the rugose striæ of the whorls and by its conoidal spire.

10. HELIX (ANGASELLA) CYRTOPLEURA, Pfr.

This strongly plicate, flattened, and widely umbilicated species belongs to a group of which it appears to be the only hitherto known representative. It somewhat resembles *H. plicaria* of Teneriffe in the character of its sculpture; but the outer lip is narrower and less expanded, and the umbilicus deep and wide.

Mr. Arthur Adams has separated this species as belonging to a peculiar group, for which he has proposed the name of *Angasella*.

From the plains near Lake Torrens.

11. HELIX (CHAROPA) JULIODEA, Forbes.

This beautiful radiately sculptured and delicate species occurs also in New South Wales, where it is pretty generally distributed.

Found at Rapid Bay, near Cape Jervis, in the ravines of the high hills bordering on the coast.

12. HELIX (CHAROPA) MURRAYANA, Pfr.

A small, flattened, finely plicate species, with a large umbilicus.

From under stones and amongst grass in the ledges of the sandstone-cliffs of the Murray.

13. HELIX (THALASSIA) RUSTICA, Pfr.

A small, vitreous, reddish horn-coloured species, with a very small deep umbilicus. This species is also found in other parts of Australia.

From Rapid Bay, in the same localities as *H. juliodea*.

14. HELIX (THALASSIA) SUBANGULATA, Ad. & Ang., n. s.

*H. testa orbiculato-conoidali, pertenui, pellucida, vitrea, pallide*

*straminea, anguste umbilicata; anfractibus planis, tenuissime concentricè striatis, ultimo ad peripheriam subangulato; apertura perobliqua, lunato-ovali, latiore quam longa; labio acuto, breviter reflexo, umbilicum vix tegente.*

Long.  $\frac{1}{2}$  lin., lat. 3 lin.

*Hab.* South Australia, under stones and logs (*Coll. Angas.*).

A small species, somewhat resembling *H. rustica*, Pfr., but with the last whorl subangular at the periphery, and with a narrow umbilicus, which is nearly concealed by a short reflexion of the columellar margin.

#### 15. BULIMUS (LIPARUS) ANGASIANUS, Pfr.

This fine *Bulimus*, which is rather more than an inch in height, having the body-whorls handsomely banded with white and brown, belongs to the Western Australian group *Liparus*, which is represented there by *B. melo*, *B. trilineatus*, *B. physoides*, and others.

My specimens were obtained from an open heath at Port Lincoln. I possess two dead specimens of *B. physoides* from Western Australia, and one of *B. meridionalis*, an East African species, which I obtained on the sea-beach near Port Adelaide. These must probably have been carried thither by the strong westerly winds and currents which prevail during the winter months.

#### 16. BULIMINUS (CHONDRULA) ADELAIDÆ, Ad. & Ang., n. s.

*B. testa turrata, pupiformi, in medio dilatata, umbilicata, albido-badia; anfractibus 6, convexis, longitudinaliter strigillatis; apertura rotundato-ovata; peritremate interrupto, albo, late reflexo; labio superne callo tuberculiformi albo munito.*

Long. 3 lin., lat. 1 lin.

*Hab.* South Australia, rocky places (*Coll. Angas.*).

A small pupa-like species having all the characters of *Chondrula*, which it appears to represent in South Australia, where it is generally distributed. In Western Australia there is an allied species, which we have elsewhere described as *Chondrula lepidula*.

#### 17. VERTIGO AUSTRALIS, Ad. & Ang., n. s.

*V. testa sinistrorsa, apice obtuso, rimato-umbilicata, pallide fusca; anfractibus 7, convexis, oblique valde striatis; apertura semiovata, peritremate incrassato et late dilatato, plica unica parietali et plica unica columellari munita.*

Long. 2 lin., lat.  $\frac{3}{4}$  lin.

*Hab.* Rapid Bay, in crevices of rocks (*Coll. Angas.*).

A cylindrical and, for the genus, a large species, with the aperture furnished with but two plicæ.

#### 18. SUCCINEA STRIGATA, Pfr.

A strongly plicate species with a papillary spire; pretty generally distributed throughout the country, in barren sandstone places.

## 19. SUCCINEA ARBOREA, Ad. &amp; Ang., n. s.

*S. testa oblongo-ovata, spira quam apertura brevior, apice papilloso, alba, aureo-cornea, pellucida; anfractibus 3, valde convexis, longitudinaliter strigosis; apertura oblongo-ovata, labio callo tenui instructo; labro arcuato, simplici.*

Long. 4 lin., lat. 2 lin.

*Hab.* Burnside; hills near Adelaide; beneath bark of gum-trees (*Coll. Angas.*).

The habits of this species differ from those of *S. strigata*, Pfr., which are strictly terrestrial, the animals making their appearance after rain, and spreading over the hills in considerable numbers. Our species, on the contrary, shelters itself beneath the loose bark of the *Eucalypti*.

## 20. BLANFORDIA STRIATULA, Menke.

This species of *Blanfordia* is the only example of an operculate land-shell that I have met with in South Australia. The same species is found in Tasmania.

From the hills near Adelaide.

## 4. DESCRIPTIONS OF FIFTEEN NEW SPECIES OF LAND-SHELLS, FROM THE COLLECTION OF II. CUMING, ESQ. BY DR. LOUIS PFEIFFER.

1. HELIX LABUANENSIS, Pfr. *T. imperforata, conoideo-depressa, tenuis, carinata, striatula et liris minutis elevatis prope suturam distinctioribus cincta, cornea; spira concaviusculo-conoidea, apice acutiuscula; sutura marginata; anfr. 7, subplani, lente accrescentes, ultimus non descendens, acutissime carinatus, basi parum convexus; apertura obliqua, depresso securiformis; perist. simplex, rectum, margine supero brevi, antrorsum arcuato, basali a carina recedente, leviter arcuato, ad insertionem subcalloso.*

Diam. maj.  $16\frac{1}{2}$ , min. 15, alt. 6 mill.

*Hab.* In insula Labuan (*Mr. Hugh Low*).

2. HELIX HUGONIS, Pfr. (182 a). *T. sinistrorsa, clause perforata, turbinata, solida, undique conferte et subargute granulato-striata, superne fuscula; spira conoidea, vertice obtusulo; anfr. 8, lente accrescentes, convexiusculi, supra suturam flavescentes, ultimus compressus carinatus, infra carinam inflatus, castaneus; apertura obliqua, irregulariter angulato-lunaris, intus margaritacea; perist. subsimplex, margine supero brevi, basali perarcuato, versus perforationem subincrassato et leviter dilatato.*

Diam. maj. 38, min. 35, alt. 21-22 mill.

*Hab.* In insula Labuan (*Mr. H. Low*).

3. HELIX CEROCONUS, Pfr. (194 a). *T. subperforata, conica, tenuiuscula, striatula, cerea; spira convexiusculo-conica, vertice obtusulo; sutura filomarginata; anfr. 6-6 $\frac{1}{2}$ , convexiusculi, lente*



*accrescentes, ultimus convexior, non descendens, periphæria subacute carinatus; apertura vix obliqua, angulato-lunaris; perist. simplex, rectum, marginibus distantibus, supero brevi, basali leviter arcuato, versus insertionem sensim dilatato, reflexiusculo.*

Diam. maj.  $8\frac{1}{2}$ , min. 8, alt.  $5\frac{1}{2}$  mill.

*Hab.* In insula Labuan (*Mr. H. Low*).

4. *HELIX JUCUNDA*, Pfr. (263 a). *T. subclausæ perforata, conoideo-depressa, tenuis, sub lente conferte striata, nitida, fusco-cornea; spira breviter conoideo-elevata, vertice subtili; anfr.  $6\frac{1}{2}$ , convexiusculi, lente accrescentes, ultimus non descendens, periphæria rotundatus, basi medio impressus; apertura vix obliqua, irregulariter lunaris, intus submargaritacea; perist. simplex, rectum, marginibus distantibus, dextro regulariter arcuato, columellari declivi, parum arcuato, ad insertionem breviter reflexo.*

Diam. maj. 17, min.  $15\frac{1}{2}$ , alt. 9 mill.

*Hab.* In insula Labuan (*Mr. H. Low*).

5. *HELIX DURA*, Pfr. (387 a). *T. perforata, depressa, solida, carinata, superne subconferte plicato-striata, nitidula, fusco-isabellina; spira brevissime conoidea, vertice minuto obtusulo; sutura linearis, anguste marginata; anfr.  $5\frac{1}{2}$ , vix convexiusculi, lente accrescentes, ultimus non descendens, periphæria compresse et acute carinatus, subtus modice convexus, leviter radiato-striatus; apertura obliqua, depresso subrhombæo-lunaris; perist. rectum, margine supero tenui, basali a carina subito recedente, quasi rostram formante, tum usque ad perforationem leviter incrassato.*

Diam. maj. 34, min. 30, alt. 11 mill.

*Hab.* Waigiou Island (*Mr. Wallace*).

6. *HELIX NIGROFASCIATA*, Pfr. (1655 a). *T. anguste umbilicata, globoso-trochiformis, solidula, oblique regulariter striata, lineisque impressis antrorsum descendentibus dense decussata, lutea, fasciis 2 latis nigris et interdum cinnamomea infra illas cincta; spira turbinata, vertice acutiusculo; anfr. 4, convexi, ultimus inflatus, antice vix descendens, subtus spiraliter leviter striatus; apertura obliqua, rotundato-lunaris, intus alba, nigro fasciata; perist. album, marginibus convergentibus, dextro anguste expanso et reflexiusculo, columellari late reflexo, supra umbilicum fornicatim dilatato.*

Diam. maj. 19, min. 17, alt. 13 mill.

*Hab.* Admiralty Islands.

7. *HELIX LATIZONA*, Pfr. (1912 a). *T. mediocriter umbilicata, depressa, tenuiuscula, striatula, vix nitidula, fusca, zona latiuscula alba ad suturam notata; spira subplana; anfr.  $4\frac{1}{2}$ , superi vix convexiusculi, ultimus rotundatus, superne antice subsulcatus, deflexus, subtus constrictus; apertura obliqua, rotundato-ovalis; perist. undique sublato expansum, marginibus convergentibus, columellari tuberculo oblongo-nodiformi intus munito.*

Diam. maj.  $26\frac{1}{2}$ , min. 21, alt. 11 mill.

*Hab.* In insula Ceram (*Mr. Wallace*).

8. *BULIMUS DOHRNI*, Pfr. (133 a). *T. imperforata, oblongo-conica, solida, lævigata, sulphurea; spira elongata, subregulariter conica, varicibus nigro-castaneis 1-2 notata, apice obtusulo; anfr. 7, vix convexiusculi, ultimus  $\frac{1}{3}$  longitudinis paulo superans, basi rotundatus, infra medium fascia lata livida vel virescente notatus; apertura parum obliqua, parvula, subrhombico-ovalis; columella brevis, superne subplicata; perist. vix expansum, crassum, lacteum, striga castanea cinctum, marginibus callo crasso albo intrante junctis.*

Long. 45, diam. 21 mill. Ap. 16 mill. longa,  $9\frac{1}{2}$  lata.

*Hab.* Cochin-China.

9. *BULIMUS RECEDENS*, Pfr. (252 a). *T. compresse umbilicata, ovato-subfusiformis, tenuis, lævigata, pallide flavida, strigis undulatis subinterruptis fuscis picta; spira subexacte conica, apice acuta; anfr. 6, pluniusculi, ultimus spiram superans, basi recedens, vix attenuatus; columella inflata, torta; apertura vix obliqua, oblongo-ovalis, superne angulata; perist. tenue, albidum, margine dextro latiuscule expanso, columellari reflexo, superne dilatato.*

Long. 27, diam. 12 mill.

*Hab.* Mozobamba.

10. *PUPA SOLUTA*, Pfr. *T. profunde rimata, elongato-conica, tenuis, levissime striatula, pellucida, fusco-cornea; spira ovato-conica, vertice acutiusculo; anfr. 9, convexiusculi, ultimus antice solutus, horizontaliter productus, basi compressus; apertura basi axin excedens, truncato-ovalis, lamellis 6 elongatis fere clausa, 1 parietali et suprema palatali validioribus, marginem attingentibus, secunda palatali, 1 basali et 2 columellaribus profundioribus; perist. continuum, tenue, breviter expansum, margine supero libero, strictiusculo.*

Long. 8, diam. anfr. penultimi 3 mill.

Locality unknown; perhaps of a new genus, allied to *Tomigeres*.

11. *SUCCINEA COCHINCHINENSIS*, Pfr. (14 a). *T. depresso ovata, tenuis, ruguloso-striata, pellucida, albido-cornea; spira parvula, subpapillata; anfr.  $2\frac{1}{2}$ , ultimus magnus, obliquus, basi subcompressus; columella filaris, callosa, subtorta; apertura obliqua, angulato-ovalis, intus submargaritacea, antice non incurvens; perist. simplex, margine dextro subflexuoso.*

Diam. maj. 11, min.  $6\frac{2}{3}$ , alt.  $4\frac{1}{2}$  mill. Apertura 10 mill. longa.

*Hab.* Cochin-China.

12. *PTEROCYCLOS LABUANENSIS*, Pfr. (1 a). *T. late umbilicata, subdiscoidea, solida, subtilissime striatula, sordide flavida unicolor vel in anfract. superioribus castaneo distanter flammulata; spira vix elevata, vertice corneo submucronato; anfr.  $4\frac{1}{2}$ , convexiusculi, rapide accrescentes, ultimus subdepresso rotundatus, non descendens; apertura fere diagonalis, circularis; perist. duplex; internum porrectum, superne leviter incisum, externum latere sinistro*

*reflexum, dextro sublato patens, superne cucullatim dilatatum et subdeflexum. Operc. planiusculum, calcareum, marginibus anfractuum infundibuliformiter elevatis.*

Diam. maj. 18, min. 14, alt. 5 mill.

*Hab.* In insula Labuan (*Mr. H. Low*).

13. *PTEROCYCLOS LOWIANUS*, Pfr. (1 b). *T. late umbilicata, subdiscoidea, tenuiuscula, subtiliter striatula, sericina, fulva, flammis saturate castaneis amœne picta; spira planiuscula, vertice submucronato; anfr. 4½, convexi, regulariter accrescentes, ultimus teres, antice paululum descendens; apertura diagonalis, circularis; perist. duplex; internum brevissime porrectum, juxta anfr. contiguum vix sinuatum; externum latere sinistro angustissimum, dextro breviter patens, superne dilatatum et protractum, vix concavum. Operc. præcedentis.*

Diam. maj. 15½, min. 12½, alt. 5½ mill.

*Hab.* In insula Labuan (*Mr. H. Low*).

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14. *PUPINA MERIDIONALIS*, Pfr. (4 a). *T. oblonga, tenuiuscula, levissime striatula, subpellucida, succineo-cornea; spira sensim in conum acutiusculum attenuata; sutura levis, simplex; anfr. 7, summi convexiusculi, sequentes planiores, penultimus longus, ultimus antice subascendens, basi axin excedens; apertura obliqua, circularis, bicanaliculata; callus parietalis arcuatus, latere dextro in linguam triangularem, sinistro in linguam latam transverse truncatam abiens; perist. subincrassatum, breviter expansum, cum lingua sinistra directione parallelâ recedens.*

Long. 13, diam. 6 mill.

*Hab.* North Australia.

15. *PUPINA PLANILABRIS*, Pfr. (4 b). *T. subrimata, oblongo-conica, tenuiuscula, sub lente striatula, subsericea, carneo-fuscula; spira conica, apice acutiuscula; sutura simplex; anfr. 7, convexiusculi, penultimus longus, latere aperturae subplanulatus, ultimus brevis, descendens; apertura subverticalis, circularis, lineariter bicanaliculata; callus parietalis planus, subsolutus, latere dextro breviter ligulatus, sinistro infra medium oblique resectus; perist. plane expansum, utrinque cxtus cum linguis junctum et infra rimam umbilicalem cristulam e canali punctiformi exeuntem formans.*

Long. 12½, diam. 5½ mill.

*Hab.* North Australia.

5. DESCRIPTIONS OF TEN NEW SPECIES OF LAND-SHELLS, FROM THE COLLECTION OF GEORGE FRENCH ANGAS, ESQ. BY DR. LOUIS PFEIFFER.

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1. *HELIX INCLINATA*, Pfr. (387 b). *T. subclausa perforata, conoideo-depressa, solida, carinata, superne conferte rugoso-striata,*

*nitidula, pallide fusca; spira regulariter conoidea, vertice minuto obtusulo; sutura marginata, carina subprominula; anfr. 6, vix convexiusculi, lente accrescentes, ultimus non descendens, acute carinatus, basi convexus, substriatus, nitidior, medio pallidior, impressus; apertura fere diagonalis, angulato-lunaris, intus margaritacea; perist. rectum, margine supero simplici, basali regulariter arcuato, versus perforationem subincrassato, eam lamina triangulari claudente.*

Diam. maj. 30, min.  $26\frac{1}{2}$ , alt. 14 mill.

Hab. Louisiade Group, New Caledonia. *Guinea*

2. *HELIX LINCOLNIENSIS*, Pfr. (564 a). *T. umbilicata, subconoideo-depressa, tenuis, superne conferte rugoso-striata et subtilissime granulata, pellucida, unicolor castanea; spira subconoideo-elevata, vertice obtusulo; anfr. 5, convexiusculi, ultimus subdepresso-rotundatus, antice non descendens, subtus circa umbilicum angustum leviter radiato-striatus; apertura obliqua, rotundato-lunaris; perist. simplex, rectum, marginibus convergentibus, columellari superne in laminam reflexam fuscam dilatato.*

Diam. maj. 22, min. 19, alt. 12 mill.

Hab. Port Lincoln.

3. *HELIX MURRAYANA*, Pfr. (654 a). *T. umbilicata, depressa, tenuiuscula, confertissime filoso-plicata, vix nitidula, fusca; spira plana; anfr. 5, convexiusculi, regulariter accrescentes, ultimus rotundatus, non descendens; umbilicus  $\frac{1}{4}$  diametri subæquans; apertura parum obliqua, rotundato-lunaris; perist. simplex, rectum, marginibus conniventibus, columellari juxta umbilicum vix dilatato.*

Diam. maj. 7, min. 6, alt. 3 mill.

Hab. Murray Cliffs, South Australia.

4. *HELIX CASSANDRA*, Pfr. (1080 b). *T. mediocriter umbilicata, globoso-depressa, tenuis, striatula et minutissime granulata, parum nitens, superne pallide isabellina, fasciis nonnullis saturatoribus obsolete notata, subtus albida; spira breviter conoideo-elevata, vertice minuto; anfr. 5, regulariter accrescentes, superi vix convexiusculi, ultimus inflatus, antice vix deflexus; apertura parum obliqua, rotundato-lunaris, intus submargaritacea; perist. simplex, tenue, margine dextro recto, basali reflexiusculo, juxta umbilicum in laminam triangularem fornicatam dilatato.*

Diam. maj. 26, min. 22, alt. 15 mill.

Hab. Murray Cliffs, South Australia.

5. *HELIX ZENOBIA*, Pfr. (1131 a). *T. sublata umbilicata, conoideo-lenticularis, solida, superne ruditer et conferte plicata, acute carinata, rufa; spira breviter conoidea, apice obtusa; sutura submarginata; anfr.  $5\frac{1}{2}$ , convexiusculi, lente accrescentes, ultimus non descendens, supra carinam convexior, basi leviter radiato-striatus, sensim in umbilicum transiens; apertura perobliqua,*



*subrhombeo-lunaris; perist. rectum, marginibus subconvergentibus, supero antrorsum arcuato, basali incrassata.*

Diam. maj. 22, min. 20, alt. 9 mill.

*Hab.* New Georgia.

6. *HELIX EVANDALEANA*, Pfr. (1167 b). *T. subanguste umbilicata, depressa, solidula, carinata, superne rugoso-striata et granulata, pilis brevibus obsita, subpellucida, fusca; spira parum elevata, vertice obtuso; sutura profunda, carina magis minusve prominente marginata; anfr. 4, convexi, ultimus supra medium carina funiformi et interdum angulo secundo obsolete circumdatus, basi levius striatus, plano-convexus; apertura obliqua, late lunaris; perist. simplex, marginibus vix convergentibus, dextro recto, basali reflexiusculo, juxta umbilicum subdilatato.*

Diam. maj.  $17\frac{1}{2}$ , min. 15, alt. 9 mill.

*Hab.* Evandale, South Australia.

7. *HELIX PERINFLATA*, Pfr. (1601 a). *T. umbilicata, globosa, solida, striis incrementi rugosis et lineis impressis antrorsum descendentibus decussata, isabellino-albida; spira convexo-conoidea, apice obtusa; anfr.  $4\frac{1}{2}$ , ultimus magnus, ventrosus, subtus perinflatus, striis spiralibus obsolete sculptus, antice deflexus; apertura diagonalis, lunari-rotundata; perist. breviter expansum, margine columellari supra umbilicum angustum fornicatim dilatato.*

Diam. maj.  $23\frac{1}{2}$ , min. 20, alt. 20 mill.

*Hab.* McDonnell Ranges, Central Australia; found by Mr. Waterhouse on Stuart's Expedition.

8. *HELIX CARCHARIAS*, Pfr. (1606 a). *T. subobtecte perforata, conoideo-globosa, solidula, sub lente minutissime granulata, carnea; spira conoidea, vertice levigato obtusulo; anfr. 5, convexiusculi, superi irregulariter tuberculato-plicati, ultimus ventrosus, superne levius plicatus, subtus radiato-striatus, albidus, antice profunde deflexus; apertura diagonalis, subcircularis; perist. simplex, tenue, anguste expansum, marginibus approximatis, columellari fornicatim supra umbilicum late reflexo.*

Diam. maj. 17– $19\frac{1}{2}$ , min.  $13\frac{1}{2}$ –16, alt.  $10\frac{1}{2}$ –14 mill.

*Hab.* Sharks' Bay, N. W. Australia.

9. *HELIX CURTISIANA*, Pfr. (1681 a). *T. anguste umbilicata, conoideo-semiglobosa, solida, striata, castanea; spira conoideo-convexa, superne albida, vertice obtusulo; sutura albo filosa; anfr. 6, lente accrescentes, ultimus magnus, convexus, supra medium subangulatus, basi planiusculus, antice descendens; apertura fere diagonalis, rotundato-lunaris; perist. vix incrassatum, anguste expansum, margine columellari superne triangulatim dilatato.*

Diam. maj. 29, min. 25, alt. 17 mill.

*Hab.* Port Curtis, N. E. Australia.

10. *BULIMUS ANGASIANUS*, Pfr. (773 a). *T. imperforata, ovato-conica, tenuis, plicis longitudinalibus confertis, sulcis spiralibus*

*interruptis sculpta, castanea, fasciis 2 albis ornata; spira convexo-conica, apice obtusulo alba; anfr. 5, modice convexi, ultimus spiram superans, infra medium leviter striatus, basi rotundatus; apertura parum obliqua, angulato-ovalis, intus margaritacea, albo fasciata; perist. simplex, rectum, margine dextro antrorsum subcurvato, columellari albo-callosa, arcuato, intrante.*

Long.  $25\frac{1}{2}$ , diam. 14 mill.

*Hab.* Port Lincoln, South Australia.

6. ON THE BREEDING OF THE GREEN SANDPIPER (*HELODROMAS OCHROPUS*). BY ALFRED NEWTON, M.A., F.L.S., F.Z.S.

Ornithologists are aware of the very different positions often chosen for their nests by birds of the same species. Thus Eagles may be found sometimes building their eyries upon trees, at others on cliffs, and again sometimes absolutely upon the flat ground. The same may be said of some species of Falcons and of some Herons. Certain Crows also and the Stock-Dove (*Columba cænas*) exhibit a like disparity of habit. Even among the members of the Gallinaceous order a similar diversity is occasionally, though rarely, to be observed. I have been told, on authority I cannot question, of a common Pheasant (*Phasianus colchicus*) and of a Capercally (*Tetrao urogallus*) each choosing a nest in a tree wherein to lay its eggs. Instances of the common Wild Duck (*Anas boschas*) breeding in hollow stumps of trees are very frequent; and with the Ducks of the genus *Aix* this seems to be the normal mode of nidification. But, excepting in the last case, this peculiarity in the selection of a site for the nest seems to result from the particular fancy (or instinct, it may be) of the individual; and in that exceptional case the general habits of the birds are so essentially arboreal that we need not wonder at the fact of their using trees for their nurseries as well as for their usual places of lodging. The only instances parallel to the one I am going to adduce are, so far as I can call to mind, those of the Golden-eye (*Clangula glaucion*), the Goosander (*Mergus serrator*), and the Smew (*Mergus albellus*). Each of these three birds departs from the manner of nidification which obtains among its brethren, just as I shall show that the Green Sandpiper (*Helodromas ochropus*\*) does.

Though I do not pretend to lay before you any novel facts this evening, yet it will be, I think, admitted that hitherto we have had in England but little positive information on the mode of breeding of the Green Sandpiper; such as it is, however, I will proceed to notice it. First, I must say that I think the story of the nest of this bird "by the side of a clay-pit" in Norfolk, as told in Mr. Yarrell's 'British Birds' (vol. ii. p. 529) and in Mr. Lubbock's

\* The osteology of the *Tringa ochropus*, Linn., presents such a marked deviation from that of the other *Totani* which I have examined, that I do not hesitate in this case to follow Dr. Kaup in considering it the type of a distinct genus.

'Fauna of Norfolk' (p. 75), can hardly be relied on—not, of course, that there is the slightest reason to doubt the implicit good faith of Sir Thomas Beavor, on whose authority it appears to rest. Next there is the statement contributed to the last edition of Mr. Hewitson's 'Eggs of British Birds' (ed. 3. vol. ii. p. 334\*) by Mr. Tristram, to the effect that he found the species breeding near sluggish streams or mountain tarns between Bodö and Quickjock in Lapland. Now this particular district has since been visited by three other excellent observers, to no one of whom did the Green Sandpiper reveal itself. I therefore hope I may be pardoned for suggesting the possibility of a mistake in my friend's assertion.

In the 'Naumannia' for 1851 (vol. i. part 2, p. 50), Herr Pässler mentions that he had, through his friend the Oberförster Wiese, obtained an egg of *Totanus glareola*, with the remark that this species of Sandpiper always "nests upon a tree;" but in the same periodical for 1852 (vol. ii. part 1, p. 95) he states that Baron von Homeyer had informed him that the egg in question was not that of *T. glareola*, but of *T. ochropus*, and adds that during his stay at Haff he had seen many nesting-places of this latter species; they were on the borders of "Elsenbrüche" [*quære*, swamps of the Service-tree (*Pyrus domestica*)?], in the middle of the forest, where the trees stand upon hillocks. In the 'Journal für Ornithologie' for 1855 (vol. iii. p. 514), the above-mentioned Herr Wiese, writing on the Ornithology of Pomerania, especially in the district of Cöslin, says that he had first heard from an old sportsman, who knew the peculiarities of all the forest-animals, that the *Totanus ochropus* nested in old Thrushes' nests, which information, he remarks, "I naturally did not believe;" but he states that some years after, in 1845, he obtained from the same man four fine eggs of a bird of this species, which for many years had been wont to nestle in an old beech tree. Still doubtful on the subject, the following spring he himself found a nest of the bird on a pine which had a fork about five-and-twenty or thirty feet high. "Joyfully," he says, "I climbed the tree, and found in that fork four eggs on a simple bed of old moss." He goes on to say that in the spring of 1853 he again obtained four eggs of the same species; and in the spring of 1854 (the year he was writing) he found a nest placed in the old nest of a Song-Thrush, out of which the shed buds of the beech had not so much as been removed. There were four eggs, which were hard set upon on the 25th of May.

In the 'Naumannia' for 1856 (vol. vi. p. 34), in an account of an excursion in Western Pomerania ("*Vorpommern*"), Dr. Altum states that *Totanus ochropus* returns annually to its old nesting-places, these being Misseltoe-Thrushes' nests, whose remains were still to be seen, often some hundred yards distant from the nearest pool, and their height fifteen feet or more from the ground. The same journal for 1857 contains a valuable series of observations on the birds of the same district by Herr W. Hintz, in which the author says (vol. vii. part 1, p. 14) that on the 6th of May, 1855, he found three eggs of this bird on an "Else" [*quære*, *Pyrus do-*